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FROM: **EDWARD W. GOODMAN**

REGISTRATION NUMBER: 28,613

PHILIPS ELECTRONICS NORTH AMERICA CORPORATION
P.O. BOX 3001
BRIARCLIFF MANOR, NEW YORK 10510

TELEPHONE: (914) 333-9611

Enclosed: Response to Non-Compliant Appeal Brief

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of Atty. Docket

ANTONIUS A.C.M. KALKER ET AL. PHN 17,025

Serial No.: 09/348,891 Group Art Unit: 2616

Filed: July 6, 1999 Examiner: T.Q. Tran

Title: DETECTION OF A WATERMARK IN A COMPRESSED VIDEO SIGNAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notification of Non-Compliant Appeal Brief mailed April 20, 2006, enclosed herewith is an amended Appeal Brief.

Respectfully submitted,

By _____
Edward W. Goodman, Reg. 28,613
Attorney
(914) 333-9611

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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DETECTION OF A WATERMARK IN A COMPRESSED VIDEO SIGNAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPEAL BRIEF

This is an appeal from the Examiner of Group 2616 finally rejecting claims 1-4 and 6 in this application.

(i) Real Party in Interest

The real party in interest in this application is U.S. PHILIPS CORPORATION by virtue of an assignment from the inventors recorded on July 6, 1999, at Reel 10091 Frames 0192-0193.

(ii) Related Appeals and Interferences

There was a prior appeal in this application to the Board, Appeal No. 2004-0926, with respect to which a decision was rendered on August 31, 2004.

(iii) Status of the Claims

Claims 1-4 and 6 stand finally rejected by the Examiner. Claim 5 has been cancelled.

(iv) Status of Amendments

There was one (1) Amendment filed on October 10, 2005, after final rejection of the claims on August 25, 2005, this Amendment having been entered by the Examiner.

(v) Summary Of Claimed Subject Matter

A watermark is often embedded in a video signal by slightly modifying the luminance pixels of the video signal in accordance with a watermark pattern. The subject invention addresses the problem of detecting a watermark in a compressed video signal (e.g., MPEG compression). While a straightforward approach would be to decode the MPEG signal and then apply the decoded MPEG signal to a conventional watermark detector, in the case of, for example, a DVD drive for a computer, this straightforward approach entails unnecessary expense for the MPEG decoder when this may not be needed, i.e., all that is needed is to determine whether the video program is watermarked.

With the above in mind, the subject invention, as claimed in claims 1, 4 and 6, includes "accumulating spatially corresponding coefficients of a plurality of pictures". This is shown in Figs. 1

and 2, and described in the Substitute Specification on page 6, line 6 to page 7, line 13, in which a variable length decoder 1 decodes the codewords representing the coefficients in the MPEG signal, and then "The spatially corresponding coefficients of a plurality of pictures are accumulated in an accumulation buffer 3."

The claimed invention further includes "inverse transforming said accumulated coefficients into an accumulated plurality of pictures". This is shown in Fig. 1 and described in the Substitute Specification on page 7, lines 14-18, in which the accumulated coefficients are then subjected to an inverse transformation in the DCT circuit 5, thereby transforming the accumulated coefficients into the spatial domain.

Finally, the claimed invention includes "detecting the watermark in said accumulated plurality of pictures". This is shown in Fig. 1, and described in the Substitute Specification on page 7, lines 18-19, in which the now accumulated spatial "picture" is then applied to a conventional watermark detection circuit 6. It should be noted that U.S. Patent 5,933,798 is cited in the Substitute Specification on page 2, paragraph [0004], as an example of such a conventional watermark detector.

(vi) Grounds of Rejection to be Reviewed on Appeal

Whether the invention, as claimed in claims 1-4 and 6 is anticipated, under 35 U.S.C. 102(e), by U.S. Patent 6,278,792 to Cox et al.

(vii) Arguments

The Cox et al. patent discloses a robust digital watermarking in which a watermark to be embedded in a picture is a vector W[k], k=1..N. The watermark is embedded in the DCT domain. To this end, an equally long vector V[k] is extracted from the picture. More particularly, the DCT coefficients of the picture are classified into N sets. A weighted sum of the coefficients of set 1 constitutes V[1], a weighted sum of the coefficients of set 2 constitutes V[2], etc. The picture is modified such that its vector V[k], k=1..N, has a high correlation with W[k].

Watermark detection is shown in Fig. 8 and described in Cox et al. at col. 12, line 12, to col. 13, line 8. The detector receives an MPEG stream. The stream is Huffman decoded (80) so that the DCT coefficients are available. The coefficients are classified as described above and summed in an accumulator (82) to obtain a vector having length N. This vector is then correlated (84) with the watermark W[k] to be detected. In the event that the input signal is uncompressed video data, Cox et al., in Fig. 9 and at col. 13, lines 9-32, indicates that that the uncompressed video

data is first accumulated in 8x8 accumulators 90, and subjected to DCT transform in DCT transformer 92 thereby forming nxn DCT's (i.e., discrete cosine transform coefficients). The watermark is then detected in these DCT's according to that shown in Fig. 8, i.e., accumulating the DCT's in watermark accumulators 94, and comparing the output of watermark accumulators 94 with possible watermarks in comparator 96.

As noted in Cox et al. at col. 13, lines 33-38, "A limitation of block based DCT methods is their sensitivity to spatial shifts of the image. For example, if the image is shifted two pixels to the right, then the DCT coefficients change significantly, so that the watermark cannot be detected. Furthermore, general distortions, such as scaling and rotation, also make the watermark undetectable." Cox et al., at col. 13, line 39 to col. 17, line 40, then describes processes for compensating for the offset of the nxn grid, and further states "These processes are performed in the registration process 108 as will be explained later." Then, Cox et al. states that the output from the registration process is accumulated and converted into the DCT domain, and the watermark is extracted using accumulators 114, watermark extractor 116 and watermark decoder 118 (Fig. 10, col. 17, line 51 to col. 18, line 23).

A. Claims 1, 4 and 6

The Examiner, in rejecting the claims, states:

> "Regarding claim 1, Cox et al discloses a method of detecting a watermark in a compressed video signal (Fig. 10) comprising spectral coefficients obtained by transforming picture of said video signal, the method comprising the steps:
> accumulating spatially corresponding coefficients of a plurality of picture (step 102 of Fig. 10, col. 17, lines 51-58);
> inverse transforming said accumulated coefficients into an accumulated plurality of pictures (step 104 of Fig. 10, col. 17, line 59 to col. 18, line 1); and
> detecting the watermark in said accumulated plurality of pictures (steps 106-118 of Fig. 10, col. 18, lines 1-12)."

It is well founded that "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Further, "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Appellants submit that the Examiner has mischaracterized the reference in an attempt to show the elements of the subject invention. In particular, while Cox et al. shows the specific

elements of the subject invention, Cox et al. does not show or suggest that these elements should be used for detecting a watermark in a compressed video signal as specifically claimed in, for example, claim 1.

In particular, the Examiner cites the steps "accumulating spatially corresponding coefficients..." (step 102), "inverse transforming..." (step 104) and "detecting the watermark in said accumulated plurality of pictures" (steps 106-118) which appear, to some extent, in claim 1 (as well as claims 4 and 6), and states that these elements "disclose a method of detecting a watermark in a compressed video signal (Fig. 10)...."

Appellants submit that the Examiner is mistaken. In particular, Fig. 10 not only relates to detection of a watermark, but also to compensating for translational registration. In particular, Cox et al. specifically states that the steps accumulating in 8X8 accumulators 102, inverse conversion 104, and accumulating in accumulators 106, provide input for registration 108 (col. 17, line 51 to col. 18, line 5). This registration process is described at col. 15, line 36 et seq., which states "The second way, which compensates for translations of non-even multiples of n pixels, uses a pattern (referred to as a "registration pattern") which can be inserted at the time of watermark insertion. By finding the location where the registration signal best matches a predefined signal, a detector can determine

how much to shift the data **before extracting the watermark**." (emphasis added).

At col. 18, lines 5-16, Cox et al. specifically states:

> "The registration data outputted from registration process 108 is accumulated in accumulators 110 and converted into the DCT domain in DCT converter 112 for watermark extraction by use of accumulators 114, watermark extractor 116 and watermark decoder 118. In watermark extractor 116, the DCT coefficients outputted from accumulator 114 are classified into N sets according to the functions h_m (i,j) and summed for extracting a watermark. The obtained watermark is provided to watermark decoder 118, in which the processes executed in comparator 84 in FIG. 8 for finding a watermark corresponding to the extracted watermark. The watermark considered to have been inserted is outputted from the watermark decoder 118."

Appellants submit that it should be patently clear from the above that Cox et al. discloses that watermark detection is performed by the accumulators 114, watermark extractor 116 and watermark decoder 118, after the signal from the accumulators 110 have been converted into the DCT domain in DCT converter 112, and that this watermark detection process is per Fig. 8 which specifically shows detecting the watermark in the DCT domain.

However, the subject invention, as claimed in claim 1, specifically states "accumulating spatially corresponding coefficients of a plurality of pictures" (in the DCT domain), "inverse transforming said accumulated coefficients into an accumulated plurality of pictures" (the spatial domain), and "detecting the watermark in said accumulated plurality of pictures" (the spatial domain).

Appellants submit that while Cox et al. discloses "accumulating" and "inverse transforming", these steps are done for identifying registration shifts, and not for watermark detection.

The Examiner now quotes from Cox et al., col. 17, line 51, to col. 18, line 12, and states "From the above passage, it is noted that the process of finding the offset value of the 8x8 grid and compensating for the offset using 8x8 accumulators 106 and the registration process 108 is pad [sic] of the process of detecting the watermark." The Examiner further adds "Since finding the offset value of the 8x8 grid and compensating for the offset is part of the process of detecting watermark and is in spatial domain, the claimed "detecting the watermark in said accumulated plurality of pictures" is anticipated by steps 106 to 118 of Cox et al."

Appellants submit that the Examiner is mistaken. What Cox et al. is disclosing is two separate processes, i.e., one for finding the offset value, and the other for detecting the watermark. While these two processes are being performed in tandem, they are nonetheless two separate processes. Cox et al. clearly indicates that watermark detection is to be performed in the DCT (transform) domain: "If MPEG video is the input image data format, the following detection process determines whether watermark W is present, where W[1,...,N] =the watermark being tested for. Decode the Huffman code, <u>but do not computer the inverse DCT's</u>, so that, for each frame (at least, each I-frame), there is an array of 8x8

DCTs. Next perform the same summation of DCT coefficients that was performed during watermark insertion to obtain the vector V. Compute the correlation coefficient C, between V and the watermark being tested for, W...." (emphasis added) (col. 11, lines 51 et seq.).

Again, Appellants stress that the watermark detection process of Cox et al. is shown in Fig. 8 and described at col. 12, lines 12-34. It should be further noted that, at col. 12, lines 35-43, Cox et al. notes that when the input data is an uncompressed image, the DCT coefficients are obtained by first performing 8x8 DCT for the whole image. Then the watermark detection process of Fig. 8 may be performed. What is being shown in Fig. 10 is the concatenation of two processes, first the offset compensation process and then the watermark detection process, and that the watermark detection process is in accordance with Fig. 8, i.e., in the transform (DCT) domain.

Contrary to the above, the subject invention clearly states "detecting the watermark in said accumulated plurality of pictures". As noted above, an example of such watermark detection is disclosed in U.S. Patent 5,933,798, in which the watermark detection is carried out in the spatial domain.

The Examiner then states "Additionally, even if, arguendo, that finding the offset value of the 8x8 grid and compensating for the offset of Cox et al is not part of watermark detecting process,

the claimed "inverse transforming said accumulated coefficients into an accumulated plurality of pictures" is anticipated by the DCT converter 112 of Fig. 10 of Cox et al because the DCT converter 112 of Cox et al is inverse transforming of the Inverse DCT Converter 104 and the claimed detecting the watermark in said accumulated plurality of pictures is anticipated by Watermark Extractor 116 of fig. 10 of Cox et al. because the alleged "watermark detection is performed in the spatial domain" is not recited in the claims."

It should be apparent from the above that the Examiner does not understand the difference between DCT domain, which includes compressed video in the form of DCT coefficients, and spatial domain, which includes uncompressed video in the form of a plurality of pictures. As clearly indicated by Cox et al., DCT converter 112 converts the accumulated registration data into the DCT domain (col. 18, lines 5-9).

Appellants submit that it would be redundant for the phrase "watermark detection is performed in the spatial domain" to be included in the claims. In particular, claim 1 recites "A method of detecting a watermark in a compressed video signal comprising spectral coefficients obtained by transforming pictures of said video signal". This means that the signal being processed is already in the transform (DCT) domain, i.e., it comprises coefficients as opposed to pictures. Claim 1 further recites

"accumulating spatially corresponding coefficients of a plurality of pictures". This means that the coefficients in the transform domain are being accumulated. Next, claim 1 recites "inverse transforming said accumulated coefficients into an accumulated plurality of pictures". This means that the transform signal of the accumulated coefficients is changed to the spatial domain of pictures. Claim 1 finally states "detecting the watermark in said accumulated plurality of pictures". This means that watermark detection is being performed in the spatial domain. It should be noted that Cox et al. acknowledges that MPEG video (comprising coefficients) is in the DCT domain (see the designation of block 102 in Fig. 10 "8x8 ACCUMULATORS (DCT DOMAIN)"), inverse DCT conversion results in the spatial domain (see the designation of blocks 106 and 110 "8X8 ACCUMULATORS (SPATIAL DOMAIN)", and DCT conversion results in the DCT domain (see the designation of block 114 "8x8 ACCUMULATORS (DCT DOMAIN)".

B. Claims 2 and 3

The above arguments with regard to Cox et al. are incorporated herein.

Claim 2 includes the limitation "said encoded video signal includes predictively encoded pictures each comprising coefficients representing a residual picture after subtracting a prediction picture, and wherein the step of accumulating

coefficients is applied to the coefficients representing said residual pictures irrespective of coefficients representing the prediction picture", while claim 3 includes the limitation "said predictively encoded pictures further include motion vectors, and wherein the step of accumulating coefficients is carried out irrespective of said motion vectors".

The Examiner indicates that these limitations are disclosed in Cox et al. at col. 9, lines 27-49 and col. 17, lines 51-58.

Appellants again submit that the Examiner is mistaken. In particular, col. 9, lines 27-49 of Cox et al. state:

> "FIG. 2 is a schematic diagram of a typical MPEG-2 encoder. FIG. 2 depicts elements which are indispensable to execute an MPEG-2 encoding of P pictures, or to perform a combined interframe prediction and DCT coding. Input images are provided as one input to subtractor 30. The other input to subtractor 30 is predicted image generated in frame memory 32. The predicted images are subtracted from the input images at subtractor 30. A discrete cosine transform (DCT) is performed at DCT calculator 34 on the output signal from subtractor 30. The DCT coefficients are quantized in quantizer 36. The outputs of the quantizer 36 are sent to a variable length encoder 38 where Huffman encoding is performed. The quantized DCT coefficients outputted from the quantizer 36 are also sent to an inverse quantizer 40 where they are de-quantized. Inverse DCT of the de-quantized DCr coefficients is performed in the inverse DCT calculator 42. The results are added at adder 44 to the predicted image outputted from the frame memory 32, and then an image which is expected to be the same as that acquired in a decoder is reconstructed. The reconstructed image is called "a locally decoded image." This locally decoded image is stored in the frame memory 32 to produce the predicted images.";

while col. 17, lines 51-58 of Cox et al. states:

> "With reference now to FIGS. 10 and 11, there are shown the basic detection algorithms modified to compensate for translational registration. In the case of MPEG video input (FIG. 10), 8x8 DCT blocks obtained from an MPEG video stream are first classified into M groups according to their indices m of the function h_m (i,j), summed within the groups for generating M summed blocks, and the resultant summed blocks are accumulated in 8x8 accumulators 102."

It should be apparent that neither of these sections disclose or suggest the limitations of claims 2 and 3. In fact, there is no mention of "motion vectors" in this portion of Cox et al.

Based on the above arguments, Appellants believe that the subject invention is neither anticipated nor rendered obvious by the prior art and is patentable thereover. Therefore, Appellants respectfully request that this Board reverse the decision of the Examiner and allow this application to pass on to issue.

Respectfully submitted,

by _____
Edward W. Goodman, Reg. 28,613
Attorney

(viii) Appendix

CLAIMS ON APPEAL

1. (Previously Presented) A method of detecting a watermark in a compressed video signal comprising spectral coefficients obtained by transforming pictures of said video signal, the method consisting essentially of the steps:

accumulating spatially corresponding coefficients of a plurality of pictures;

inverse transforming said accumulated coefficients into an accumulated plurality of pictures; and

detecting the watermark in said accumulated plurality of pictures.

2. (Previously Presented) The method as claimed in claim 1, wherein said encoded video signal includes predictively encoded pictures each comprising coefficients representing a residual picture after subtracting a prediction picture, and wherein the step of accumulating coefficients is applied to the coefficients representing said residual pictures irrespective of coefficients representing the prediction picture.

3. (Previously Presented) The method as claimed in claim 2, wherein said predictively encoded pictures further include motion vectors, and wherein the step of accumulating coefficients is carried out irrespective of said motion vectors.

4. (Previously Presented) An arrangement for detecting a watermark in a compressed video signal comprising spectral coefficients obtained by transforming pictures of said video signal, the arrangement consisting essentially of:

means for accumulating spatially corresponding coefficients of a plurality of pictures;

means for inverse transforming said accumulated coefficients into an accumulated plurality of pictures; and

means for detecting the watermark in said accumulated plurality of pictures.

5. (Cancelled).

6. (Previously Presented) A device for recording and/or playing back a compressed video signal, said device comprising means for disabling recording and/or playback of the video signal in dependence upon the presence of a watermark in said video signal, characterized in that the device comprises an arrangement for detecting said watermark in the video signal, said arrangement

consisting essentially of:

means for accumulating spatially corresponding coefficients of a plurality of pictures;

means for inverse transforming said accumulated coefficients into an accumulated plurality of pictures; and

means for detecting the watermark in said accumulated plurality of pictures.

(ix) Evidence Appendix

There is no evidence which had been submitted under 37 C.F.R. 1.130, 1.131 or 1.132, or any other evidence entered by the Examiner and relied upon by Appellant in this Appeal.

(x) Related Proceedings Appendix

Enclosed herewith is a copy of the Decision on Appeal rendered by this Board in Appeal No. 2004-0926, identified in section (ii) above.